

24 March 2006

Barry Pulver, P.G., C.Hg., C.E.G.
County of San Diego, Department of Public Works
Landfill Management
5201 Ruffin Road, Suite D
San Diego, CA 92123

Subject: Revised Downgradient Soil Vapor Sampling Work Plan
Poway Landfill
Poway, California

Dear Mr. Pulver:

On 9 March 2006, GeoSyntec Consultants (GeoSyntec) submitted a work plan to the Regional Water Quality Control Board (RWQCB) and County of San Diego Local Enforcement Agency (LEA) to further evaluate apparent subsurface soil vapor quality in the residential community downgradient of the Poway Landfill (the site) (GeoSyntec, 2006). On 10 and 13 March 2006, GeoSyntec received comments from the RWQCB and LEA, respectively (RWQCB and LEA, 2006). Pursuant to these comments, GeoSyntec has prepared this revised Downgradient Soil Vapor Sampling Work Plan.

BACKGROUND

The site is located on the south side of Poway Road at 14900 Poway Road in Poway, California (Figure 1). In 2004 and 2005, an active soil vapor survey was conducted along the southern site boundary and within the public right-of-way of Dehia Street south of the site (GeoSyntec 2004 and 2005). Relatively low concentrations of volatile organic carbons (VOCs) were detected in soil vapor near the southern property boundary and beneath Dehia Street. The primary constituent of concern (COC) detected in soil vapor samples collected during the two independent soil vapor surveys was benzene (Figure 2). The highest concentration of benzene identified in soil vapor sampling conducted in 2004 was 68 parts per billion-vapor by volume (ppbv) in a sample collected upgradient of the residences from boring SG-9. The highest concentration of benzene identified in soil vapor sampling conducted in 2005 was 49 ppbv in a sample collected in the City of Poway right-of-way of Dehia Street downgradient of the residences from boring SG-10. However, based on the type of constituents detected in soil vapor samples collected from Dehia Street, it appears that other sources besides landfill gas from the

Poway Landfill may be contributing to the chemical quality of soil vapor in the residential community.

Based on VOCs detected in soil vapor in the southern portion of the site and the potential hypothetical risk to the residential community adjacent to the southwest site boundary, three vapor wells were installed along the southern property boundary to further evaluate potential hypothetical impacts to the adjoining residents (Figure 2). Similar to the previous soil vapor data, benzene was the primary COC detected in soil vapor samples collected from the vapor wells at concentrations ranging from 19 ppbv (PVP-2A) to 140 ppbv (PVP-1) (Figure 2).

SCOPE OF WORK

The objectives of the work described herein are to obtain the necessary data to update the vapor phase human health risk assessment and to evaluate potential vapor migration from the site to the residential community. The following tasks will be performed to achieve the project objectives:

- Task 1: Install and Sample Soil Vapor Wells Onsite
- Task 2: Evaluate Subsurface Utilities
- Task 3: Install and Sample Soil Vapor Wells in the City of Poway right-of-ways
- Task 4: Perform Soil Vapor Sampling on Residential Properties
- Task 5: Prepare Work Plan to Perform Indoor Air and/or Below Slab Soil Vapor Sampling
- Task 6: Update Human Health Risk Assessment
- Task 7: Perform Engineering Feasibility Study
- Task 8: Prepare Report

TASK 1: INSTALL AND SAMPLE ONSITE SOIL VAPOR WELLS

The purpose of this Task is to evaluate the radius of influence of landfill gas extraction wells located near the toe of the landfill and to further evaluate the performance of the landfill gas extraction system to control vapor migration. Four soil vapor well clusters will be installed within the refuse and within the soil directly below the refuse at the toe of the landfill. An additional soil vapor well cluster will be installed between the

desiltation basin and the southern site boundary (Figure 3). In addition, two background soil vapor wells will be installed near the northern and eastern site boundaries.

The vacuum from the vapor wells will be measured when the landfill gas extraction system is on and when the system has been shut down for 48 hours to evaluate the radius of influence of landfill gas extraction wells near the toe of landfill.

Soil vapor samples will be collected from vapor well clusters screened in the waste and soil directly below waste and from selected vapor wells located at the southern site boundary. Soil vapor samples will be collected when the landfill gas system is on and also when the system has been shut down for 48 hours to evaluate the landfill gas systems performance to control landfill gas migration. Soil vapor wells will be installed and sampled as described in Task 3 below.

Storm water runoff from Poway Road flows into a concrete channel located on the east property boundary where it discharges and infiltrates in the desiltation basin on the southern property boundary (Figure 3). Soil vapor samples are not recommended in the desiltation basin due to the presence of storm water infiltrating and filling in the pore space in the sample locations. Therefore, one surface water sample will be collected in the concrete channel where storm water enters the site. In addition, soil samples will be collected from three locations within the desiltation basin. Soil samples will be collected from each boring at depths of 2.5 and 5 feet bgs. The surface water and soil samples will be analyzed for VOCs by EPA Method 8260.

TASK 2: EVALUATE SUBSURFACE UTILITIES

Potential subsurface pathways for vapor transport include vapor migration through permeable fill material surrounding utilities installed within the subsurface. Further, leaking sanitary systems may affect the chemical quality of soil vapor. GeoSyntec will review storm water and sewer as-built construction drawings and engineering specifications for City of Poway right-of-ways of Sunset View Road, Dehia, Mirando and Silla Streets, Los Olivos, El Mar and Acton Avenues to determine the location and construction specifications of these utilities in the study area. This analysis will be used to select soil vapor sampling locations adjacent to underground utilities.

TASK 3: INSTALL AND SAMPLE SOIL VAPOR WELLS IN THE CITY OF POWAY RIGHT-OF-WAYS

Based on VOCs detected in soil vapor samples collected in the southern portion of the site and beneath Dehia Street and El Mar Avenue south of the site, vapor wells will be installed within the residential community downgradient of the site to evaluate apparent subsurface soil vapor quality in the residential community (Figure 3). Eight soil vapor well clusters and six single soil vapor wells will be installed within the City of Poway right-of-ways of Sunset View Road, Dehia, Mirando and Silla Streets, Los Olivos, El Mar and Acton Avenues. The installation of vapor wells will allow for the evaluation of background soil vapor quality, soil vapor quality at the site and in the residential community.

The vapor wells will be installed within small diameter borings advanced with a direct push rig. Department of Toxic Substances Control (DTSC) guidelines require that the minimum amount of soil vapor sampling needed in the vertical direction to be collected at depths of 5 and 15 to 20 feet bgs (DTSC, 2004). However, depth to groundwater measured during the last two consecutive monitoring events in monitor wells POGW-12, -15, -17A and -18A, located in the residential community, ranged from 7 to 18 feet bgs. Therefore, soil vapor well clusters will consist of wells placed at approximate depths of 5 and 10 feet below ground surface (bgs). If groundwater is encountered in the locations of the soil vapor clusters or moisture is observed (i.e. capillary fringe) in the soil at a depth of 10 feet bgs, a single soil vapor well will be constructed at a depth of 5 feet bgs. Single vapor wells will be placed at depths of 5 feet bgs. Proposed soil vapor well construction details are provided on Figure 4.

GeoSyntec will notify Underground Service Alert of the intent to drill at the site; subcontract a geophysical survey of potential subsurface utilities or other underground obstructions; and obtain the necessary permits from the City of Poway and the County of San Diego Department of Environmental Health (DEH).

Soil vapor wells installed in the residential community will be sampled bi-weekly for one month, monthly for two months, then quarterly for three consecutive events. However, depending on the initial soil vapor sampling results, selected vapor wells may be sampled on a more or less frequent basis.

In addition to the work described above, the potential exposure to landfill-related constituents migration through utilities will be evaluated. Four soil vapor samples will be collected from within the fill material surrounding utilities located within the City of Poway right-of-way of El Mar Avenue and Dehia Street to evaluate potential vapor migration from the landfill through utilities. The vapor wells will be installed within small diameter borings advanced with hand auger equipment to the top of the fill material surrounding utilities.

Soil vapor sampling and testing procedures will be conducted in accordance with DTSC soil vapor sampling guidelines. Soil vapor samples will be collected in 1-liter Summa canisters using dedicated flow controllers calibrated by the analytical laboratory at a flow rate of 200 ml/min. Prior to collection of soil vapor samples, each of the new proposed soil vapor wells will be allowed to equilibrate for a minimum of 48 hours. Following equilibration and prior to collecting samples, three “dead space” volumes will be purged. Soil vapor samples will be collected in 1-liter Summa canisters using dedicated flow controllers calibrated by the analytical laboratory at a flow rate of 200 ml/min. In addition to the vapor samples collected from the wells, three duplicate samples, three ambient air field blank samples, and one trip blank sample will be collected per each sampling event. Soil vapor and quality control samples will be analyzed for VOCs by EPA Method TO-15 which will include three additional constituents to the list (carbon disulfide, trans-1,4-dichloro-2-butene and methyl iodide) and fixed gases by Method ASTM-D-1946 by Air Toxics Ltd. in Folsom, California.

TASK 4: PERFORM SOIL VAPOR SAMPLING ON RESIDENTIAL PROPERTIES

Based on the results of samples collected from vapor wells advanced in the City right-of-ways, a soil vapor survey may be performed on selected residential properties. Based on the initial findings, the soil borings will be advanced near selected residential properties (Figure 3). Soil borings will be advanced using small diameter drive rods to facilitate collection of soil vapor samples at a depth of 5 feet bgs. At selected locations, soil vapor samples will be collected at a depth of 2.5, 5 and 10 feet bgs to develop vertical profiles. Up to two locations per residential property, soil samples will be collected at depths of 1, 2.5 and 5 feet bgs and analyzed by ASTM D 2210 to develop soil moisture

profiles. Soil samples for soil moisture analysis will also be collected at 2.5, 5 and 10 feet bgs at locations where vertical profiles are advanced. Temporary soil vapor probes will be constructed within the small drive rod using dedicated nylon tubing for each soil vapor sample.

Soil vapor samples will be collected in 1-liter Summa canisters described in Task 3. Prior to collection of soil vapor samples, each temporary soil vapor probe will be allowed to equilibrate for a minimum of 1 hour. In addition to the vapor samples collected from the temporary borings, one duplicate sample, one ambient air field blank sample, and one trip blank sample will be collected each day sampling is performed.

Written permission from selected residential property owners will be required prior to collecting soil vapor samples next to the residential home pads. GeoSyntec will coordinate and assist the County in obtaining access to each parcel.

TASK 5: PREPARE WORK PLAN TO PERFORM INDOOR AIR SAMPLING AND/OR BELOW SLAB SOIL VAPOR SAMPLING

A detailed analysis of the need to perform indoor air sampling and/or below slab soil vapor sampling (collectively referred to as indoor air sampling) of adjacent residences will be performed. Pending the results of this analysis, indoor air sampling may be performed following recently developed, EPA and DTSC guidance. Indoor air sampling may aid to determine whether potential landfill-related COCs affect indoor air quality.

Typically, indoor air contains dozens of chemicals due to normal household products. GeoSyntec will develop an indoor air sampling plan which may include the following:

- Pre-Sampling surveys for other chemicals (paints, solvents, fuels, dry-cleaning, adhesives, new materials). Prior to sampling, this survey will be distributed to each of the target residences to identify potential sources of constituents that may be present in specific homes that are not be due to landfill gas;
- Building Design/Construction. The ventilation systems for each residence affect vapor intrusion pathways and exposure parameters;

- Outdoor Sources. Lawn maintenance procedures, residential automotive repair/maintenance, and other activities that may contribute to constituents detected in soil gas in the residential community; and
- Meteorology (barometric pressure, temperature, precipitation and wind).

After the appropriate regulatory agencies approve the work plan and right of entry agreements are executed with the property owners, the work plan to collect indoor air samples will be implemented.

TASK 6: UPDATE HUMAN HEALTH RISK ASSESSMENT

Soil vapor data collected from the vapor wells and vapor samples collected near the residential properties will be used to update the human health risk assessment described in the Report of Waste Discharge (ROWD) (GeoSyntec, 2005). The updated human health risk assessment will compare soil vapor data from the samples previously collected near the southern site boundary to the new data collected during sampling events from the wells located in the residential community. The updated human health risk assessment will be performed using the DTSC modifications to the Johnson and Ettinger (J&E) model. The results of the updated human health risk assessment will be presented in the summary report.

TASK 7: PERFORM ENGINEERING FEASIBILITY STUDY

Based on the findings of the soil vapor survey and human health risk assessment, a detailed analysis of remedial technologies and associated alternatives to mitigate potential landfill-related soil vapor impacts from the site will be completed, if warranted.

A preliminary screening of remedial alternatives has been performed. Several technologies have been evaluated that may be effective in mitigating potential landfill-related soil vapor impacts. Potential remedial alternatives are based on COC characteristics, the known extent and concentrations of COCs, remediation objectives, and previous experience at other sites. The following remedial alternatives have been considered for the Poway Landfill:

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- Soil Vapor Extraction;
- Landfill Gas Extraction System Enhancement;
- Air Curtain;
- Desiltation Basin Enhancement;
- Hydrologic Barriers;
- Natural Attenuation;
- Monitoring; and
- No Action.

Pilot studies for viable remedial measures will be performed as necessary to refine the evaluation of mitigation alternatives. The feasibility of each alternative will be evaluated based on the effectiveness, implementability, and cost. Based on this evaluation and in consultation with the RWQCB, the best-suited alternative will be implemented.

TASK 8: PREPARE REPORT

A summary report will be prepared following the completion of Tasks 1 through 7. This report will describe field procedures, results of the soil vapor sampling and updated human health risk assessment. In addition, the site conceptual model will be updated based on the findings of the work described herein. Lastly, a conceptual design for the best-suited remedial alternative will be provided, if warranted.

The final report will be submitted to the RWQCB and uploaded into the GeoTracker data base.

PROJECT SCHEDULE

Work will commence immediately after receiving the necessary permits and access agreements. It is anticipated that the encroachment permit from the City of Poway and property access agreements from selected property owners may take up to 2 months for approval. Soil vapor probe installation and soil vapor sampling could be completed within two to three weeks. Approximately six weeks will be required to evaluate analytical data, update the human health risk assessment and perform the feasibility study. Based on this schedule it is anticipated that the summary of findings report would be submitted to the RWQCB approximately two months after obtaining the permits and access agreements.

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PROPOSED WORK	SCHEDULE
Task 1 - Install and Sample Onsite Soil Vapor Wells	March - April 2006
Task 2 - Evaluate Subsurface Utilities	March 2006
Task 3 - Install and Sample Soil Vapor Wells in the City of Poway Right-of-Ways	March - April 2006
Task 4 - Perform Soil Vapor Sampling on Residential Properties	March – April 2006
Task 5 - Prepare Work Plan to Perform Indoor Air Sampling	May 2006
Task 6 - Update Human Health Risk Assessment	May – June 2006
Task 7 - Perform Engineering Feasibility Study	June 2006
Task 8 - Prepare Report	June 2006

If you have any questions or require additional information regarding the scope of work described herein, please contact the undersigned at (858) 674-6559.

Sincerely,

Sean McClain
Project Manager

Sam Williams, P.G. CHg.
Project Director

Enclosures:

Figures: Figure 1 - Site Location
Figure 2 – Primary VOC concentrations in Soil Vapor
Figure 3 - Proposed Residential and Site Soil Vapor Well Locations
Figure 4 – Soil Vapor Well Construction

REFERENCES

Department of Toxic Substances Control, 2004. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, December 2004.

GeoSyntec Consultants, 2006. *Downgradient Soil Vapor Sampling Work Plan*, Poway Landfill, prepared for County of San Diego, Department of Public Works, March 2006.

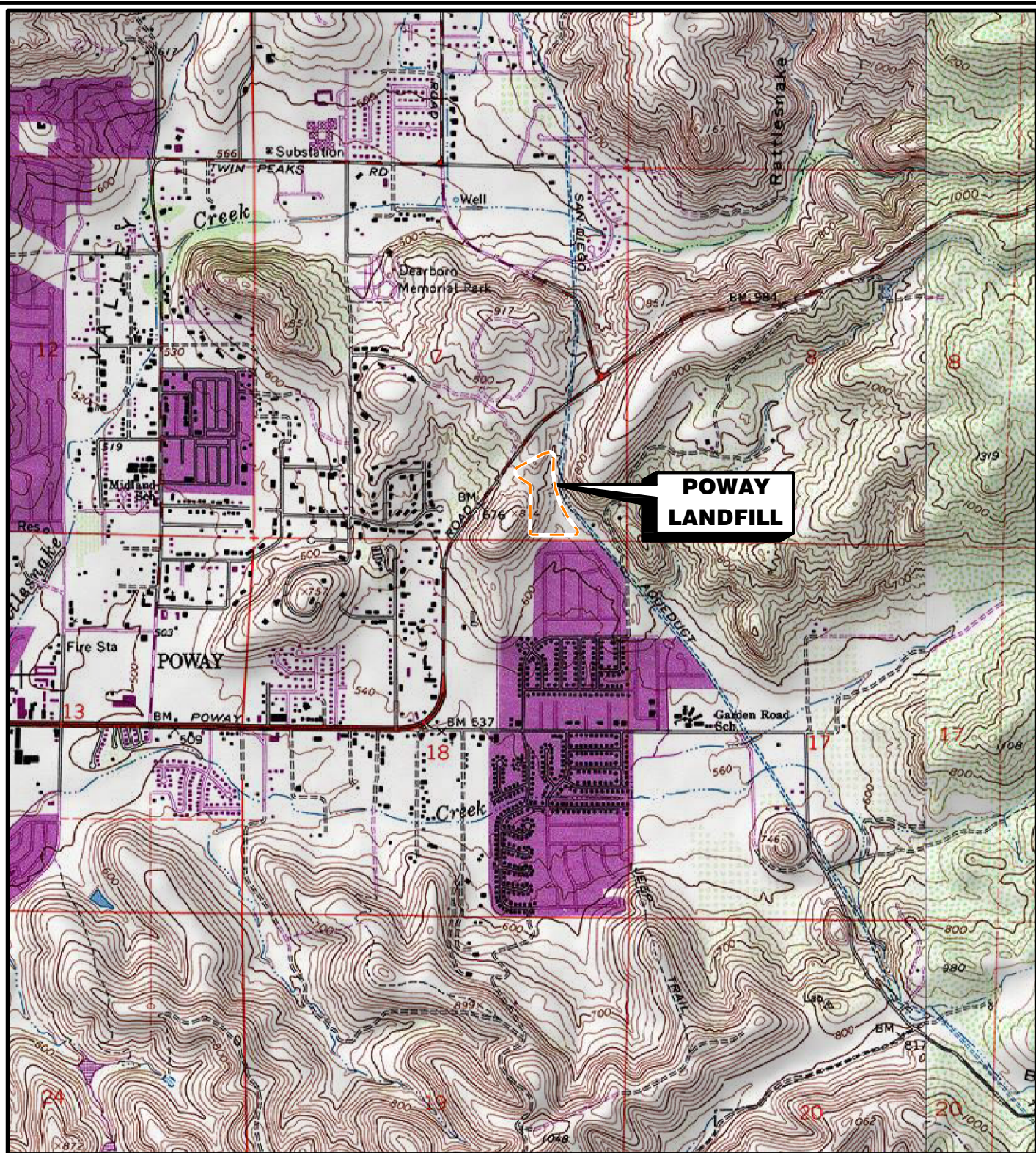
GeoSyntec Consultants, 2005. *Updated Report of Waste Discharge and Engineering Feasibility Study*, Poway Landfill, prepared for County of San Diego, Department of Public Works, December 2005.

GeoSyntec Consultants, 2004. *Phase II Evaluation Monitoring Program*, Poway Landfill, prepared for County of San Diego, Department of Public Works, August 2004.

San Diego County Department of Environmental Health Local Enforcement Agency, 2006. Comments on Work Plan, Email Correspondence from Kerry McNeill of LEA to Barry S. Pulver San Diego County Department of Public Works Landfill Management, 13 March 2006.

San Diego Regional Water Quality Control Board, 2006 Downgradient Soil Vapor Sampling Work Plan Comments, email from Kelly Dorsey RWQCB to Barry S. Pulver San Diego County Department of Public Works Landfill Management, 10 March 2006.

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SOURCE:
NATIONAL GEOGRAPHIC (CALIFORNIA)
SEAMLESS USGS TOPOGRAPHIC MAPS ON CD-ROM
POWERED BY TOPO

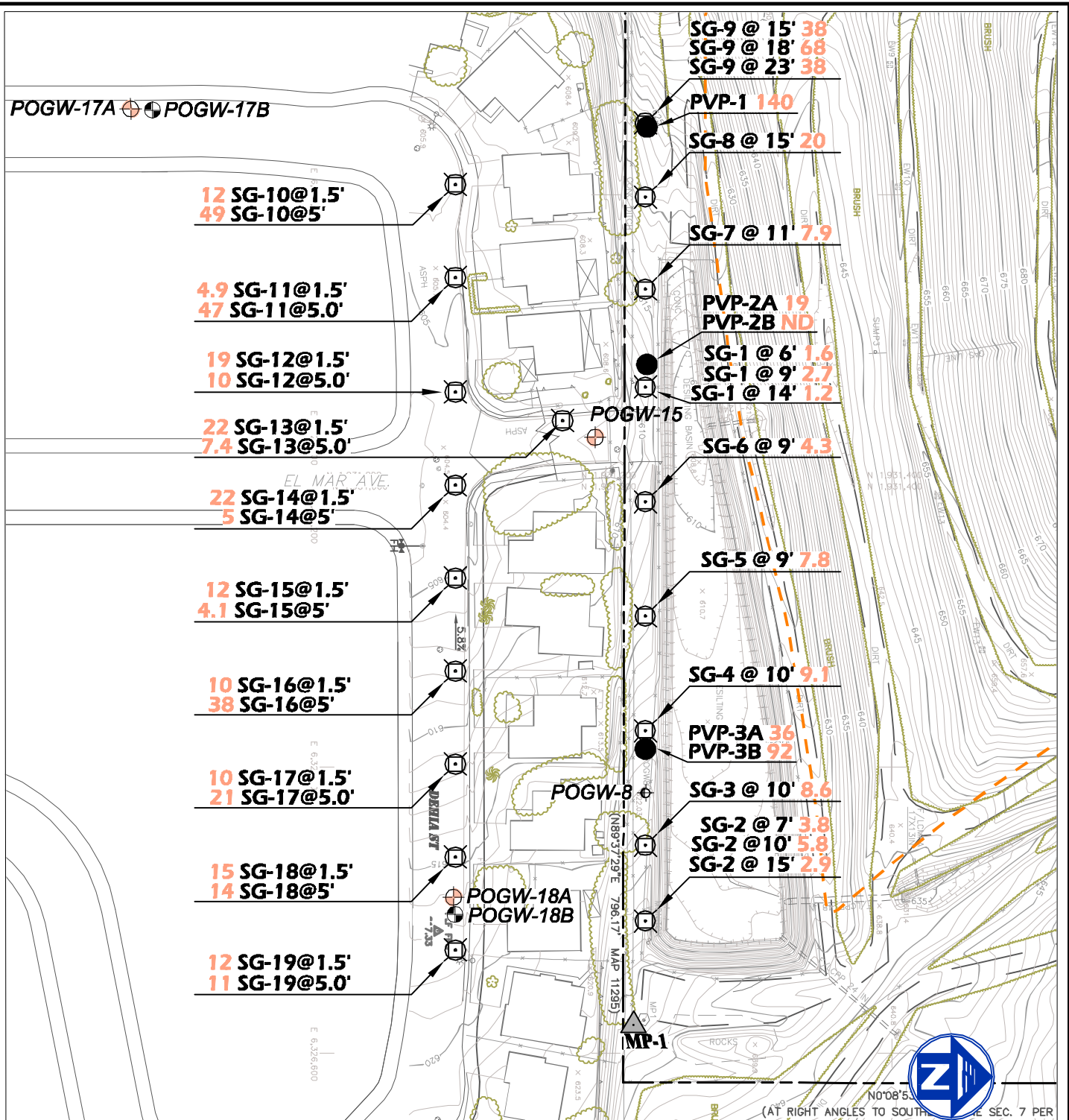


2,000 1,000 0 2,000 4,000
SCALE IN FEET



SITE LOCATION
POWAY LANDFILL
POWAY, CALIFORNIA

FIGURE NO. 1
PROJECT NO. SC0233
DATE: DECEMBER 2005



SAMPLE DATA KEY

Sampling ID and
Depth BGS.

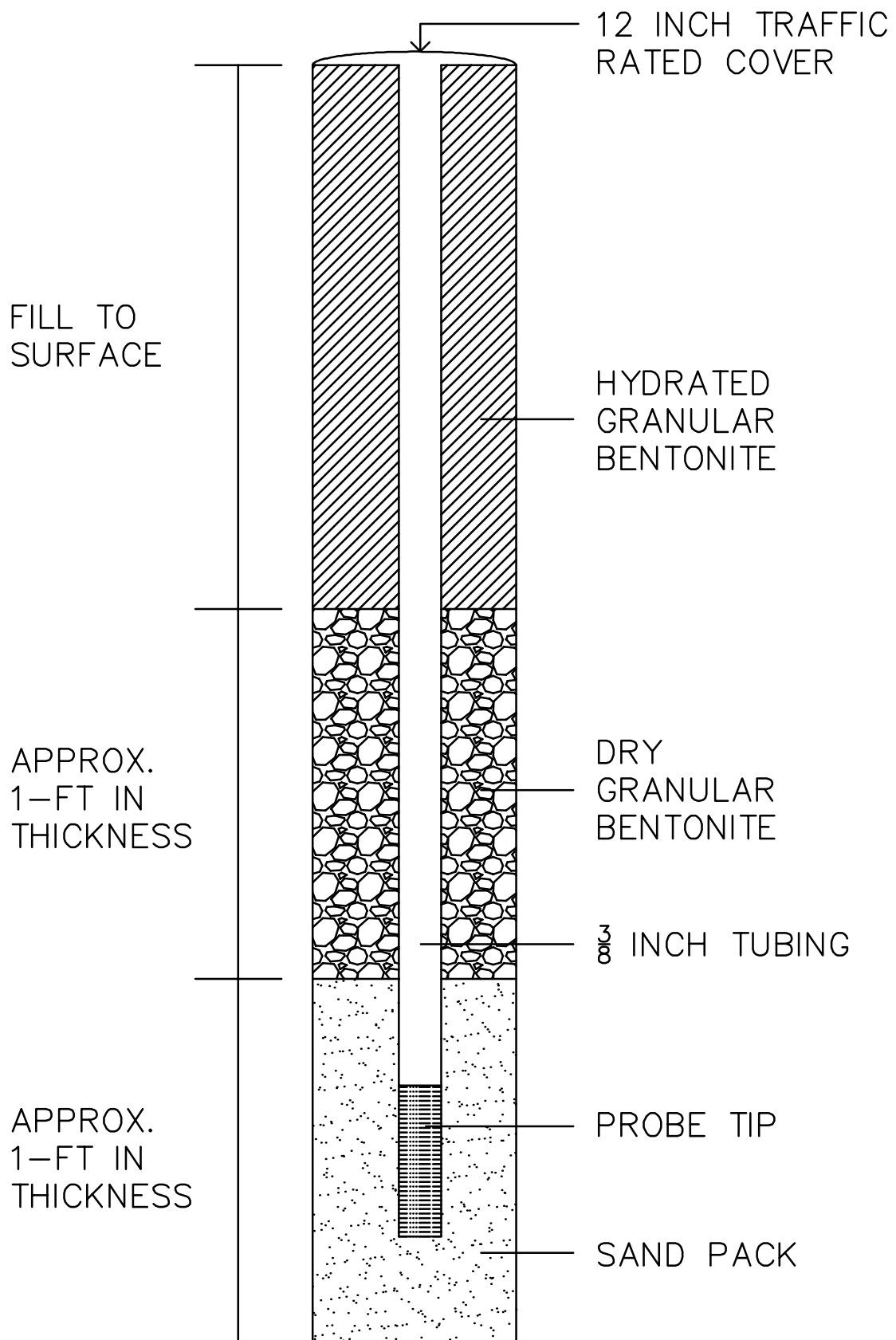
Benzene (ppbv)

SG-2 @ 15' 2.9



PRIMARY VOC CONCENTRATIONS IN SOIL VAPOR
POWAY LANDFILL
POWAY, CALIFORNIA

FIGURE NO. 2
PROJECT NO. SC0233-05-05
DATE: MARCH 2006



SOIL VAPOR WELL CONSTRUCTION
POWAY LANDFILL
POWAY, CALIFORNIA

FIGURE NO.	4
PROJECT NO.	SC0233-06-06
DATE:	MARCH 2006